MATH AND FICTION? MATH AND SOCIAL CHANGE?

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The first time I ever played that parlor game where you're supposed to tell three facts about yourself, one of which is a lie, I knew I'd win. The object of the game is for the other players to guess which "fact" is phony, and even though some of the people in that room had known me for a very long time, I was pretty sure they'd all think, "I was a math major in college," was the lie. It's surprising how rarely the topic of differential equations comes up, even among the closest of friends.

But I knew I'd studied math all those years, so I don't know why I was so shocked when I found myself driving through the fog on the Bay Bridge one summer evening to go to a lecture in San Francisco by Dr. Robert Moses, the founder of The Algebra Project.

Bob Moses has a lot of impressive credentials — including earning a PhD. in mathematics from Harvard, leading voter registration drives in Mississippi in the 1960s, winning a MacArthur "genius" grant, and being listed in U.S. News & World Report as one of America's Best Leaders of 2006 — but the only thing I knew that night was that Dr. Moses had written Radical Equations, a book about math and social change that had blown my mind.

I am a writer (which is one of the reasons my friends had no inkling of my math background; also, I don't figure out the tip at a restaurant any more quickly than the English majors), so I always have a few stories on the back burner that I'm meaning to write. One of them had haunted me for years: when I was a teenager, an acquaintance of my mother's had committed suicide. When I learned that my mother suspected that the victim's husband was involved, I was shocked that she didn't go to the police. The mystery for me was not only if, in fact, the guy had killed his wife, but more importantly, why my mom — whom I always

saw as doing the right thing — wasn't insisting upon an investigation.

The chance that I would end up telling that story through algebraic metaphors was about as likely as the chance that I'd be sitting in a room full of math activists. But there I was.

And I was fascinated as Dr. Moses explained how The Algebra Project, modeled after the Civil Rights Movement, was working to create a culture of change. Because today's tech-dependent society requires math literacy for so many jobs, it's time for all students to demand access to the advanced math classes: this, too, is what equal education means.

One idea, especially, got to me. Dr. Moses argued that algebra was developmentally appropriate for all eighth graders, not just the strongest students, because when the concept of the unknown — for example, the letter x — enters the picture, it changes everything; it changes the way you can process information, mathematically and metaphorically.

There's my story, I thought. That's exactly how I'd felt in eighth grade — as if the unknown x had been placed in my life and it had changed everything. I began to understand then that in math — and in life — some questions had more than one correct answer, and other questions, like why my mother had decided not to report a possible murder, couldn't be answered at all.

When I started writing Do the Math: Secrets, Lies and Algebra, I did the usual research — I bought a couple of algebra books; I spoke to a counselor who leads groups for teenage girls; I interviewed a coroner about how suicides are investigated. I also called a friend who was the principal of a middle school and asked her if I could observe and tutor the eighth-grade algebra class. And after a few months of working there, things began to shift for me — I cared not only about making my fiction ring true, but also about how important it was for these kids to be literate in math. I watched a brilliant teacher engage and challenge her students; I watched her try a million different approaches. To

understand the shape of parabolas, she had them throw a football, to compute the slope of a straight line, she had them burn candles and graph the weight loss as the candles melted away, and to get her students to care that the equation for that line was $y=mx+b$, she taught them how to figure out which phone plan was the biggest rip-off.

Still, a lot of these students struggled with algebra. Many of them felt alienated and embarrassed by the fact that they'd never adequately learned mental math skills — they couldn't, for example, easily figure out that if $3x=12$, then $x=4$, because they couldn't divide 12 by 3 without thinking about it. These are kids who absolutely believe they can't learn math. That's a dangerous belief system. Because one of the things Bob Moses speaks about is algebra being the "gatekeeper" subject — without it, middle school students can't advance in science, technology, engineering, or mathematics, and without those courses, they won't be able to meet the requirements for college. And how does that relate to the civil rights movement of the '60s? Here's a good ratio for you:

$$\frac{\text{reading literacy}}{\text{being able to vote in 1962}} = \frac{\text{math literacy}}{\text{entering college in 2007}}$$

Thirteen-year-old kids are too old and too cool to say that they feel hopeless about their skills — they just say that they hate the subject. The more I hung out with these students, the more I understood that my job in writing this book was to try to get under their "I hate math" radar. I know, of course, that not many teens want to read a book about the quadratic equation, but plenty of them do want to read about betrayal. (And yes, we're getting back to that original suicide/murder question; honestly, the book is a novel.)

So here's an excerpt from that "Quadratic Equations" chapter. The protagonist, Tess, has promised her mother that she won't tell anyone about the possible murder, but Tess breaks that promise and tells her closest friends the secret. This scene takes place in algebra class, right

after Tess has realized that one of her friends — she doesn't know who — has told her secret around school.

The only reason I hate quadratic equations is that there are a lot of ways to solve them. Sometimes the directions will say, "Solve by factoring" or "Solve by completing the square," so fine. But if it just says,
"Solve: $y = x^2 - 2x - 3$," then you can sit there a long time wondering, Okay, great, but what exactly am I supposed to do? Where am I supposed to start?

That's exactly how I was feeling. I was thinking about what my so-called friends had done, and I was wondering: What exactly am I supposed to do?

I guess I could start with Miranda because she's been my best friend all through middle school, and if someone is your best friend, you should be able to ask her straight out: Did you talk about my private business with other people?

Or I could write Sammy a note that said, "How would you like it if I told people your secrets? How would you like that, huh?"

There's no reason to start with Lynn, because Lynn will just lie.

When Marcus raised his hand and asked, "Why are we supposed to care about this?" which is the same question he always asks, people laughed.

But Ms. Saltzman took it seriously, of course. "How can we figure out how far and how fast objects will travel?" Ms. Saltzman asked, and even though nobody answered her question, she said, "Yes! We use a quadratic equation!"

Then she looked at Marcus, and said, "We care, Marcus, because this is the beginning of the study of physics." She was sort of whispering when she said the word. "Quadratic equations are very

important," Ms. Saltzman said, "because they are the way we can trace the path of a moving object."

Okay, great. But what I wanted to know was this: How can you trace the path of gossip? How do you know who started it, how far it went, and who else in the school knows your secret? If you want to tell me something very important, I thought, you could tell me the formula for that.

And here's what I'd like to know: how can we best convince kids of both genders and all races that they just might be talented at math? How can we help them see that the study of algebra develops conceptual thinking, keeps them from being ripped off by the phone companies, and gets them into college?

God, I'd love a formula for that.